

Application Serial No. 10/726,394  
Response to Office Action Mailed July 24, 2007

### **Remarks**

Claims 1-38 are currently pending. Claims 33-37 are withdrawn by communication of April 30, 2007. Claims 1-32 stand provisionally rejected in view of alleged obviousness-type double patenting. Claim 38 stands rejected as allegedly anticipated, and/or obvious in view of the Li reference or the He reference. Claims 20 and 21 are objected to.

Page 1 of the specification has been amended to properly recite the DoE contract number that funded at least part of the presently claimed invention.

Pages 7 and 9 of the as-filed application have been amended to more clearly described the recited silica products and conform to use of trademarks under current U.S. practice. Applicants have amended the specification to properly indicate the trademarks and have included generic product descriptions thereof. Applicants respectfully submit that the now-provided descriptions of the materials sold under the respective trademarks were known in the art at the time of filing of the present invention. Support for these amendments may be found in Exhibit A – a published web pages from PPG Industries showing that such silica products were made and known for its small median particle size and hydrophilic properties which are advantageous for used with aqueous solutions; and Exhibit B – published web pages from Cabot Corp. showing the many advantages of using fumed silica powders for adhesive and sealant applications.

Claims 20 and 21 have been amended to delete the recitation of trademarks. No new matter has been added. Applicants respectfully traverse the rejections, and request reconsideration and allowance of the pending claims.

Application Serial No. 10/726,394  
Response to Office Action Mailed July 24, 2007

**Regarding claim objections**

The recitation of trademarks has been deleted from claims 20 and 21. Claims 20 and 21 have been amended to more clearly describe the silica material rather than the source of the silica material in accordance with MPEP §§2173.05(u) and 608.01(v). Claims 20 and 21 are now more clearly directed to the use of precipitated silica and fumed silica as the silicon source for the as-claimed inventive method. Applicants respectfully submit that the now provided descriptions of the materials sold under the recited trademarks were known in the art at the time of filing of the present invention, and therefore, does not constitute new matter. Support for these amendments may also be found on newly amended pages 7 and 9 of the application. Applicants respectfully contend that these claims are now in condition for allowance. Withdrawal of the objections is earnestly solicited.

**Regarding the 102/103 rejections**

Claim 38 has been rejected as anticipated, or obvious, in view of the Li reference or the He reference. Applicants respectfully disagree.

The as-filed patent application is directed to, among other things, a process for making a mesoporous siliceous framework, such as siliceous M41S, that further makes it possible to prepare single wall carbon nanotubes with a diameter that correlates to the pore size of the framework. This is accomplished by preparing a framework from a solution having, among other things, silica, and a metal precursor. As a result, the metal ions are incorporated in silicon substitutional sites of the framework (see, for example, page 12 lines 8-9 of the as-filed specification) without the formation of metal clusters or nanoparticles of poorly controlled size, as is the case with prior art processes.

Application Serial No. 10/726,394  
Response to Office Action Mailed July 24, 2007

In stark contrast, the Li reference prepares mesoporous silica containing iron particles by a sol-gel process from a tetrathoxysilane (TEOS) hydrolysis in iron nitrate aqueous solution without a surfactant templating agent. The mixture was dried and calcined, forming a silica network with iron oxide nanoparticles embedded in the pores. The iron oxide particles were reduced to obtain iron nanoparticles. The carbon nanotubes were produced by deposition of carbon atoms obtained from decomposition of acetylene at 700 C. The carbon nanotubes had a diameter of about 30 nm; the growth direction and distribution of the nanotubes was attributed to the iron nanoparticles embedded in the pores of the mesoporous substrate.

Li surmises "that it is possible to produce arrays consisting of very thin, and possibly even single-layered carbon nanotubes by improving the growth conditions." However, Li does not disclose, teach, or even suggest a method for accomplishing this improvement, nor does he produce carbon nanotubes of < 1 nm diameter with a narrow diameter distribution. The He article, using a zeolite, is similarly lacking and does not disclose the preparation of SWCNT structures by the process recited in the independent claims of the present application.

This long-sought improvement was accomplished by the present inventors by preparing the template from a mixture of silica, preferably colloidal silica in combination with a silica salt, and a compound containing the metal ions, which were all mixed together in an aqueous solution before drying and calcination. This combination has the advantage over the process disclosed by Li, who uses TEOS without a templating agent, in that no iron oxide particles and no corresponding large iron particles are formed which are known to cause a broad diameter distribution in the grown nanotubes. It was the explicit intent of the inventors to prevent the formation of metal oxide and large (greater than 1 nm) metal particles in the pores of the

Application Serial No. 10/726,394  
Response to Office Action Mailed July 24, 2007

framework, which the inventive process accomplishes by having the metal ions bonded in tetrahedrally coordinated sites, substituting for the silicon atoms in an ordered (M41S) structure.

Applicants disclosed and claimed methods have been found to be novel and non-obvious. Nanotubes made by these claimed inventive methods exhibit more uniform size, uniform size distribution, have less defect density, and contain less impurities than nanotubes made by prior art processes. Applicants therefore respectfully contend that these benefits and properties are not conferred onto nanostructures made by the Li or He references. Put simply, Applicant's nanotubes are simply not the same as those nanotubes made by the Examiner's cited references.

Reconsideration, and allowance, of claim 38 is earnestly solicited.

**Regarding alleged double patenting**

Claims 1-32 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting in view of co-pending application no. 10/328,857. The Office Action duly notes that this is a provisional rejection since the allegedly conflicting co-pending claims have not in fact been patented at the time of issuance for the present office action. However, as of 3 December 2007, U.S. Patent Application No. 10/328,857 has been allowed.

Accordingly, and herewith, Applicants now submit a terminal disclaimer for the patent term to the patent that will issue from U.S. Patent Application No. 10/328,857.

Application Serial No. 10/726,394  
Response to Office Action Mailed July 24, 2007

**Regarding Applicants' Information Disclosure Statements**

Applicants note that the Examiner has not yet initialed or signed Applicants' IDS dated 25 August 2004, Applicants' SIDS dated 12 September 2005, Applicants' SIDS dated 20 April 2006, nor Applicants' SIDS dated 21 February 2007. These disclosures are shown as entered into the PAIR electronic file wrapper on, or near, their respective mailing dates. Applicants respectfully request confirmation of the Examiner's review and consideration of the provided references.

**Conclusion**

It is respectfully submitted that claims 1-32, and 38 are in condition for allowance, and Applicants respectfully request that allowance be granted at the earliest date possible. Should the Examiner have any questions or comments regarding Applicants' response, the Examiner is asked to contact Applicants' undersigned representative at (215) 988-2685. If there are any additional fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0573.

Respectfully submitted,

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24 Jan 08  
(Date)

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